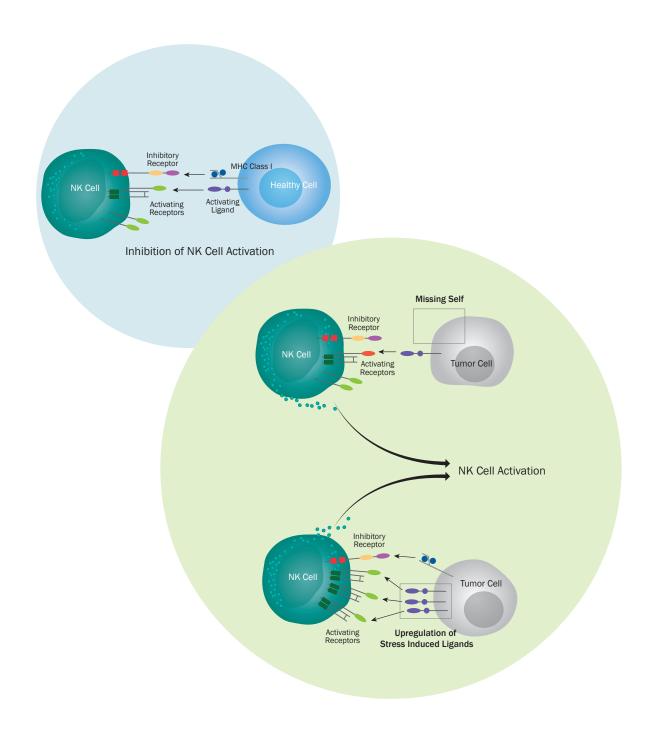


Products for Natural Killer Cell Research



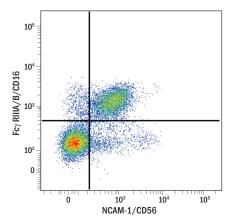
Natural Killer Cells

Natural killer (NK) cells are innate lymphoid cells that function as both cytotoxic effector cells and initiators of the adaptive immune response. Their activation is regulated by multiple inhibitory and activating cell surface receptors including the human killer immunoglobulin-like receptors (KIRs), mouse Ly49 family receptors, CD94-NKG2 heterodimeric receptors, NKG2D, and the natural cytotoxicity receptors (NCRs). These receptors regulate NK cell activation by detecting abnormalities in cells that are associated with infection or malignant transformation, such as the loss of MHC class I expression or the elevated expression of specific stress-induced ligands. Once activated, NK cells secrete pro-inflammatory cytokines and trigger Perforin/Granzyme-induced target cell lysis. Their ability to specifically attack and eliminate stressed cells, while maintaining tolerance to normal, healthy cells has led to the compelling suggestion that NK cells may have therapeutic potential as anti-cancer agents. R&D Systems offers a wide selection of reagents for culturing and characterizing NK cells and investigating NK cell-tumor cell interactions including recombinant proteins, fluorochrome-conjugated antibodies, blocking/neutralization antibodies, and ELISA Kits.

Antibodies for Select Markers Commonly used to Identify NK Cells by Flow Cytometry

Human NK Cells		Unconjugated Antibodies (Applications)						
	APC	Fluorescein	PE	PerCP	Alexa Fluor® 488	Alexa Fluor® 700	New Alexa Fluor® conjugates 405/594/647/750	
CD3	FAB100A	FAB100F	FAB100P	FAB100C	FAB100G	FAB100N	FAB100V/FAB100T/ FAB100R/FAB100S	MAB100 (FA, FC, ICC/IF, IP)
CD56	FAB2408A		FAB2408P					MAB2408 (E, FC, WB); MAB24081 (FC, IHC, WB); AF2408 (FC, ICC/IF, WB)
Fcγ RIIIA/B (CD16a/b)	FAB2546A	FAB2546F	FAB2546P	FAB2546C		FAB2546N		MAB2546 (FC)
IFN-γ	IC285A	IC285F	IC285P	IC285C	IC285G			MAB2851 (B/N, FC, ICC/IF)
Mouse NK Cells								
CD3	FAB4841A	FAB4841F	FAB4841P	FAB4841C	FAB4841G	FAB4841N	FAB4841V/FAB4841T/ FAB4841R/FAB4841S	MAB4841 (FA, FC, ICC/IF, IHC, IP)
CD27/TNFRSF7	FAB5741A		FAB5741P					MAB5741 (FC)
OD4C4 /NIV4 4	FAB8319A		FAB8319P		FAB8319G	FAB8319N		
CD161/NK1.1	FAB7614A		FAB7614P		FAB7614G			MAB7614 (FC)
IFN-γ	IC485A	IC485F	IC485P			IC485N		MAB485 (B/N, FC, WB)
Integrin α2/CD49b	FAB1740A		FAB1740P					MAB1740 (FC); AF1740 (FC, ICC/IF, WB)
Integrin αM/CD11b	FAB1124A	FAB1124F	FAB1124P	FAB1124C		FAB1124N	FAB1124V/FAB1124T/ FAB1124R/FAB1124S	MAB1124 (FC, ICC/IF, IHC, IP)
NIV. AC (NOD	FAB22252A		FAB22252P	FAB22252C	FAB22252G	FAB22252N		MAB22252 (FC)
NKp46/NCR		FAB2225F	FAB2225P					AF2225 (FA, FC, WB)

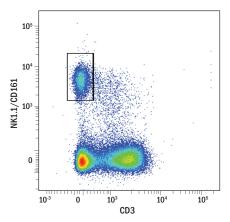
Identification of Human Natural Killer Cells by Flow Cytometry



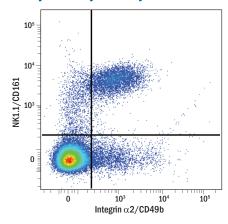
Detection of CD3-CD56+CD16-/+ Human Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and a Fluorescein-conjugated Mouse Anti-Human Fcy RIIIA/B/CD16 Monoclonal Antibody (Catalog # FAB2546F). Cells were gated on CD3- lymphocytes.

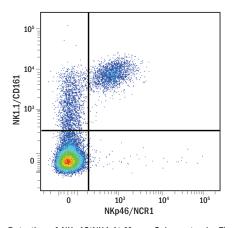


Identification of Mouse Natural Killer Cells by Flow Cytometry



Detection of CD3⁻NK1.1⁺ Mouse Splenocytes by Flow Cytometry. Mouse splenocytes were stained with an Alexa Fluor 594-conjugated Rat Anti-Mouse CD3 Monoclonal Antibody (Catalog # FAB4841T) and an APC-conjugated Mouse Anti-Mouse NK1.1/CD161 Monoclonal Antibody (Catalog # FAB8319A).





Detection of NKp46*NK1.1* Mouse Splenocytes by Flow Cytometry. Mouse splenocytes were stained with an APC-conjugated Rat Anti-Mouse NKp46/NCR1 Monoclonal Antibody (Catalog # FAB22252A) and a PE-conjugated Mouse Anti-Mouse NK1.1/CD161 Monoclonal Antibody (Catalog # FAB8319P).

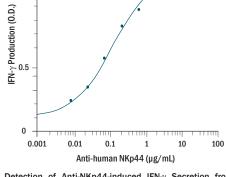
Natural Killer Cell Selection Kits

Kit	Catalog #
MagCellect™ Human NK Cell Isolation Kit	MAGH109
MagCellect™ Mouse NK Cell Isolation Kit	MAGM210

Select Recombinant Proteins for Culturing NK Cells

Molecule	Species	Catalog #
IL-2	Human	202-IL
162	Mouse	402-ML
IL-12	Human	219-IL
	Mouse	419-ML
IL-15	Human	247-IL
1612	Mouse	447-ML
IL-18	Human	B003
11-18	Mouse	B004
IL-21	Mouse	594-ML
ILZI	Human coming soon!	8879-IL

IL-2, IL-12, and IL-15 are also available as GMP-grade proteins.



Detection of Anti-NKp44-induced IFN- γ Secretion from IL-2-activated Human NK Cells Enriched using the MagCellect Human NK Cell Isolation Kit. Human peripheral blood natural killer (NK) cells were isolated using the MagCellect Human NK Cell Isolation Kit (Catalog # MAGH109). Isolated cells were treated with Recombinant Human IL-2 (Catalog # 202-IL), and the indicated concentrations of immobilized Goat Anti-Human NKp44 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF2249). IFN- γ secretion was measured using the Human IFN- γ Quantikine® ELISA Kit (Catalog # DIF50).

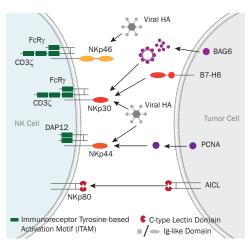


Select ELISAs and ELISpot Kits for Detecting Molecules Secreted by NK Cells

Molecule	Species	Quantikine® ELISA Catalog #	DuoSet® ELISA Catalog #	ELISpot Kit Catalog #	ELISpot Development Module Catalog #
GM-CSF	Human	DGM00	DY215		SEL215
GIVI-CSF	Mouse	MGM00	DY415		SEL415
Cuana and a D	Human			EL2906	SEL2906
Granzyme B	Mouse		DY1865	EL1865	SEL1865
IEN	Human	DIF50	DY285	EL285	SEL285
IFN-γ	Mouse	MIF00	DY485	EL485	SEL485
IL-10	Human	D1000B	DY217B	EL217B	SEL217B
IL-10	Mouse	M1000B	DY417	EL417	SEL417
TNF	Human	DTA00C	DY210		SEL210
TNF-α	Mouse	MTA00B	DY410	EL410	SEL410

Natural Cytotoxicity Receptors

Natural cytotoxicity receptors (NCRs) are expressed almost exclusively by natural killer (NK) cells and play a central role in triggering their activation. In humans, NKp30 and NKp46 are constitutively expressed on resting and activated NK cells, while NKp44 expression is induced following activation. Most tumor-associated ligands of the NCR family are unknown, but recent research demonstrated that B7-H6, which is expressed on multiple tumor cell lines, binds to NKp30 and induces NK cell activation. R&D Systems offers a wide selection of flow cytometry antibodies to detect natural cytotoxicity receptors on human and mouse cells and the only fluorochromeconjugated Anti-Human B7-H6 antibody on the market. Additionally, we offer bioactive Recombinant Human B7-H6 and NKp30 proteins. In-house studies have shown that immobilized recombinant B7-H6 protein binds to NKp30 and stimulates NK cell activation.

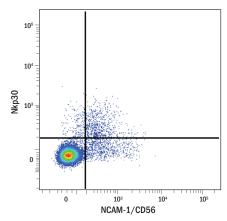


Products for Natural Cytotoxicity Receptors & Ligands

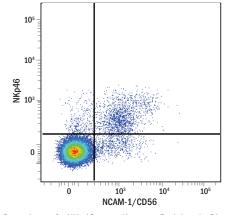
Antibodies

Molecule		Fluoroch	Unconjugated Antibodies (Applications)					
	Species	APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
B7-H6	Human	FAB7144A		FAB7144P				MAB7144 (FC)
NKp30	Human	FAB1849A		FAB1849P		FAB1849G		MAB1849 (FA, FC); MAB18491 (FA); AF1849 (WB)
NKp44	Human	FAB22491A		FAB22491P				MAB22491 (FA, FC); MAB2249 (WB); AF2249 (FA, WB)
	Human	FAB1850A	FAB1850F	FAB1850P				MAB1850 (FA, FC, ICC/IF, WB); AF1850 (ICC/IF, WB)
NKp46/NCR1		FAB22252A		FAB22252P	FAB22252C	FAB22252G	FAB22252N	MAB22252 (FC)
	Mouse		FAB2225F	FAB2225P				AF2225 (FA, FC, WB); MAB2225 (WB)
NKp80/KLRF1	Human	FAB1900A		FAB1900P				MAB1900 (FC); AF1900 (FC, WB)

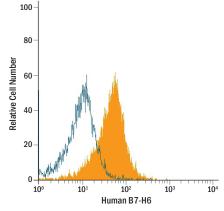
Most fluorochrome-conjugated antibodies are available in both a 25-test and 100-test size.



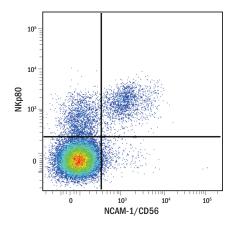
Detection of NKp30 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with an APC-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408A) and a PE-conjugated Mouse Anti-Human NKp30 Monoclonal Antibody (Catalog # FAB1849P).



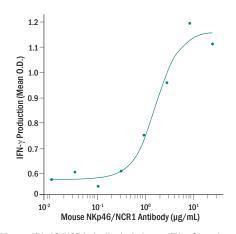
Detection of NKp46 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and a Fluorescein-conjugated Mouse Anti-Human NKp46 Monoclonal Antibody (Catalog # FAB1850F).



Detection of B7-H6 on HeLa Cells by Flow Cytometry. The HeLa human cervical epithelial carcinoma cell line was stained with an APC-conjugated Mouse Anti-Human B7-H6 Monoclonal Antibody (Catalog # FAB7144A; filled histogram) or an APC-conjugated Mouse $\lg G_1$ Isotype Control (Catalog # ICO02A; open histogram).

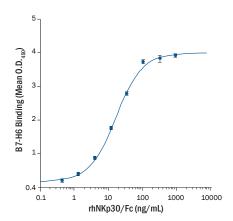


Detection of NKp80 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and an APC-conjugated Mouse Anti-Human NKp80 Monoclonal Antibody (Catalog # FAB1900A).

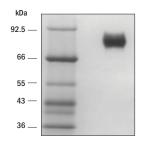


Mouse NKp46/NCR1 Antibody Induces IFN-γ Secretion from Activated Mouse Natural Killer Cells. Mouse natural killer cells were activated with Recombinant Mouse IL-2 (Catalog # 402-ML), Recombinant Mouse IL-12 (Catalog # 419-ML), and the indicated concentrations of Goat Anti-Mouse NKp46/NCR1 Antigen Affinity-purified Polyclonal Antibody (Catalog # AF2225). IFN-γ secretion was measured using the Mouse IFN-γ Quantikine ELISA Kit (Catalog # MIFOO).

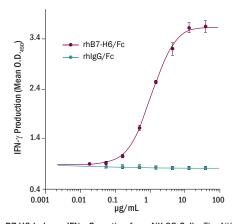
Recombinant Proteins							
Molecule	Species	Catalog #					
B7-H6	Human	7144-B7					
NKp30	Human	1849-NK					
NKp44	Human	2249-NK					
NI/m 4C	Human	1850-NK					
NKp46	Mouse	2225-NK					
NKp80	Human	1900-NK					



Recombinant Human B7-H6 Binds to NKp30. Immobilized Recombinant Human B7-H6 Fc Chimera (Catalog # 7144-B7; 0.5 μ g/mL) was incubated with increasing concentrations of Recombinant Human NKp30 Fc Chimera (Catalog # 1849-NK). The concentration of Recombinant Human NKp30 Fc Chimera that produces 50% of the optimal binding response was approximately 8–40 ng/mL.



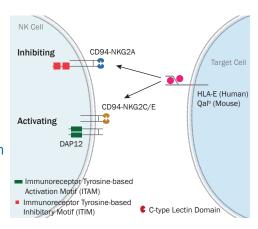
SDS-PAGE Analysis of Recombinant Human B7-H6 under Reducing Conditions. Recombinant Human B7-H6 Fc Chimera (Catalog # 7144-B7) was resolved by SDS-PAGE and visualized by silver staining under reducing conditions.



B7-H6 Induces IFN- γ Secretion from NK-92 Cells. The NK-92 human natural killer lymphoma cell line was incubated with the indicated concentrations of immobilized Recombinant Human B7-H6 Fc Chimera (Catalog # 7144-B7) or Recombinant Human $\lg G_{1}/Fc$ (Catalog # 110-HG) for 24 hours. IFN- γ Secretion was measured using the Human IFN- γ Quantikine® ELISA Kit (Catalog # DIF50). The ED $_{50}$ for this effect is typically 0.6–3 $\mu g/m L$.

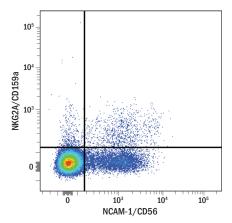
NKG2 Family Receptors

Human CD94-NKG2 heterodimeric receptors have either inhibitory or activating effects on natural killer (NK) cells depending on the NKG2 family member. CD94-NKG2C and CD94-NKG2E are both activating receptors, while CD94-NKG2A inhibits NK cell activation. Heterodimers of human CD94-NKG2A, C, or E recognize human leukocyte antigen (HLA)-E, while the corresponding mouse heterodimers recognize Qa1^b. R&D Systems exclusively offers fluorochrome-conjugated Anti-Human NKG2C antibodies, in addition to fluorochrome-conjugated Anti-Human CD94 and Anti-Human and Mouse NKG2A antibodies.

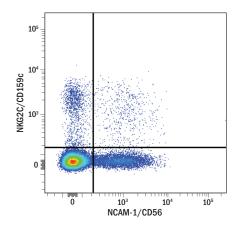


Products for NKG2 Family Receptors

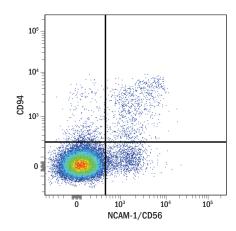
Molecule	Species		Fluoroch	Unconjugated Antibodies (Applications)					
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 647	Alexa Fluor 700	
CD94	Human	FAB1058A	FAB1058F	FAB1058P					MAB1058 (B/N, FC)
NKG2A	Human	FAB1059A		FAB1059P	FAB1059C			FAB1059N	MAB1059 (FC)
NNG2A	Mouse	FAB6867A		FAB6867P		FAB6867G			MAB6867 (FC)
NKG2C	Human	FAB138A		FAB138P	FAB138C	FAB138G	FAB138R	FAB138N	MAB138 (FC); MAB1381 (FC)



Detection of NKG2A/CD159a in Human Peripheral Blood Mononuclear Cells by Flow Cytometry. Human peripheral blood mononuclear cells were stained with an APC-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408A) and a PE-conjugated Mouse Anti-Human NKG2A/CD159a Monoclonal Antibody (Catalog # FAB1059P).



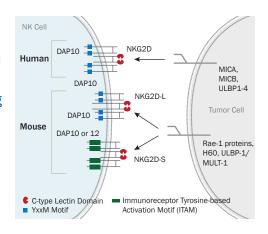
Detection of NKG2C/CD159c in Human Peripheral Blood Mononuclear Cells by Flow Cytometry. Human peripheral blood mononuclear cells were stained with an APC-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408A) and a PE-conjugated Mouse Anti-Human NKG2C/CD159c Monoclonal Antibody (Catalog # FAB138P).



Detection of CD94 in Human Peripheral Blood Mononuclear Cells by Flow Cytometry. Human peripheral blood mononuclear cells were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and an APC-conjugated Mouse Anti-Human CD94 Monoclonal Antibody (Catalog # FAB1058A).

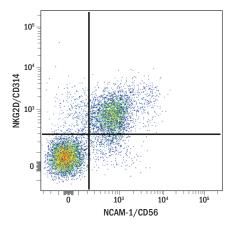
NKG2D

NKG2D is a homodimeric, natural killer (NK) cell-activating receptor that is distantly related to the NKG2 family. It recognizes several tumor-associated and stess-induced ligands such as MICA, MICB, and ULBP1-6 in human and members of the Rae1 family, H60, and MULT-1/ULBP-1 in mouse. R&D Systems exclusively offers fluorochrome-conjugated antibodies for detecting tumor-associated NKG2D ligands, as well as fluorochrome-conjugated Anti-Human and Anti-Mouse NKG2D antibodies. Recombinant proteins and unconjugated blocking/neutralization antibodies are also available to investigate NK cell – tumor cell interactions and the effects of different tumor-associated ligands on NK cell activity.

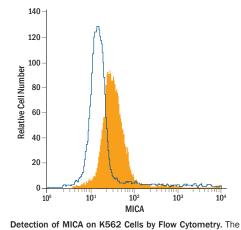


Products for NKG2D and NKG2D Ligands

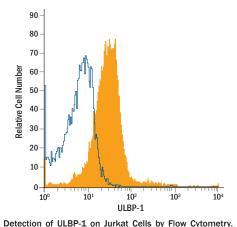
Molecule	Species		Fluorochrome	Unconjugated Antibodies (Applications)				
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
NIVCOD	Human	FAB139A		FAB139P	FAB139C	FAB139G	FAB139N	MAB139 (B/N, FA, FC, WB)
NKG2D	Mouse	FAB1547A	FAB1547F	FAB1547P				MAB1547 (B/N, FC, WB)
H60	Mouse	FAB1155A		FAB1155P		FAB1155G	FAB1155N	MAB1155 (B/N, E, FC, WB)
MICA	Human	FAB1300A		FAB1300P		FAB1300G		MAB1300 (B/N, FC, WB)
MICB	Human	FAB1599A		FAB1599P	FAB1599C	FAB1599G	FAB1599N	MAB1599 (E, FC, WB)
MICA/B	Human	FAB13001A		FAB13001P		FAB13001G	FAB13001N	MAB13001 (B/N, FC, IHC)
Rae-1 Pan	Mouse	FAB17582A	FAB17582F	FAB17582P	FAB17582C		FAB17582N	MAB17582 (FC)
Rae-1α/β/γ	Mouse	FAB1758A				FAB1758G		MAB1758 (B/N, FC)
Rae-1ε	Mouse	FAB1135A		FAB1135P				MAB1135 (B/N, FC)
LII DD 4	Human	FAB1380A		FAB1380P	FAB1380C	FAB1380G		MAB1380 (B/N, FC)
ULBP-1	Mouse	FAB2588A		FAB2588P	FAB2588C		FAB2588N	MAB2588 (FC)
ULBP-2/5/6	Human	FAB1298A	FAB1298P		FAB1298C			MAB1298 (B/N, FC)
ULBP-3	Human	FAB1517A		FAB1517P				MAB1517 (B/N, FC)
ULBP-4/RAET1E	Human	FAB6285A		FAB6285P				MAB6285 (FC, IHC, WB)



Detection of NKG2D in Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with an APC-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408A) and a PE-conjugated Mouse Anti-Human NKG2D/CD314 Monoclonal Antibody (Catalog # FAB139P). Cells were gated on CD3 lymphocytes.



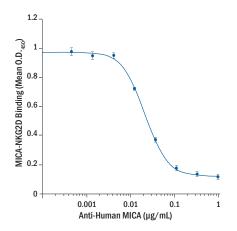
K562 human chronic myelogenous leukemia cell line was stained with an Alexa Fluor® 488-conjugated Monoclonal Antibody (Catalog # FAB1300G; filled histogram) or Alexa Fluor 488-conjugated Mouse IgG₂₈ Isotype Control (Catalog # IC0041G; open histogram).



Detection of ULBP-1 on Jurkat Cells by Flow Cytometry. The Jurkat human acute T cell leukemia cell line was stained with an APC-conjugated Mouse Anti-Human ULBP-1 Monoclonal Antibody (Catalog # FAB1380A; filled histogram) or an APC-conjugated Mouse IgG_{2A} Isotype Control (Catalog # ICO03A; open histogram).

Recombinant Proteins

Molecule	Species	Catalog #
NIVOOD	Human	1299-NK
NKG2D	Mouse	139-NK
H60	Mouse	1155-H6
MICA	Human	1300-MA
MICB	Human	1599-MB
Rae-1α	Mouse	1158-RA
Rae-1ß	Mouse	1198-RA
Rae-1γ	Mouse	1136-RA
Rae-1δ	Mouse	1134-RA
Rae-1ε	Mouse	1135-RA
III DD 4	Human	1380-UL
ULBP-1	Mouse	2588-MU
ULBP-2	Human	1298-UL
ULBP-3	Human	1517-UL
ULBP-4/RAET1E	Human	6285-UL
ULBP-5	Human	7149-UL
ULBP-6/RAET1L	Human	7485-UL



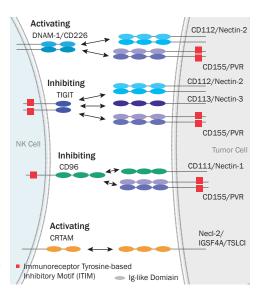
0.8 0.7 0.00 motion 0.5 0.0.4 0.3 0.1 1 1 10 100 RAET1E/ULBP-4 (µg/mL)

Neutralization of Recombinant Human MICA Binding to NKG2D. Binding of Recombinant Human MICA Fc Chimera (Catalog # 1300-MA; 50 ng/mL) to immobilized Recombinant Human NKG2D Fc Chimera (Catalog # 1299-NK; 2 µg/mL) was blocked with increasing concentration of Mouse Anti-Human MICA Monoclonal Antibody (Catalog # MAB1300). 50% of the binding was blocked by 0.02–0.06 µg/mL of this antibody.

RAET1E/ULBP-4 Induces IFN-y Secretion from NK-92 Cells. The NK-92 human natural killer lymphoma cell line was treated with increasing concentrations of immobilized Recombinant Human RAET1E/ULBP-4 (Catalog # 6285-UL). IFN-y secretion was measured using the Human IFN-y Quantikine ELISA Kit (Catalog # DIF50).

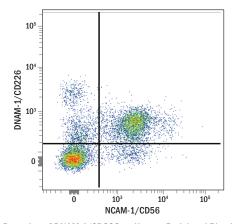
Nectin and Nectin-like Binding Receptors

Natural killer (NK) cells and CD8⁺ T cells express the nectin and nectin-like binding receptors, DNAM-1/CD226, TIGIT, CRTAM, and CD96. DNAM-1/ CD226 and TIGIT both bind to CD112/Nectin-2 and CD155/PVR, two proteins which are frequently up-regulated on tumor cells, but they have opposing effects on NK cell activity. DNAM-1/CD226 is expressed on resting NK cells and promotes NK cell activation, while TIGIT expression is elevated following NK cell activation and negatively regulates NK cell cytotoxicity. Additionally, CD96 competes with DNAM-1/CD226 for binding to CD155/ PVR and inhibits IFN-y production by NK cells, suggesting that blockade of the interactions between TIGIT and CD155/PVR and/or CD96 and CD155/ PVR may have beneficial anti-tumor effects. As preliminary research has revealed the complexity of the interactions among these receptors and their involvement in tumor surveillance, the effects of these receptors on NK cells warrant further investigation. R&D Systems offers Recombinant Human or Mouse DNAM-1/CD226, TIGIT, CRTAM, CD155/PVR, Necl2/TSCL1, and Nectin-2/CD112, as well as fluorochrome-conjugated antibodies for all of these targets.

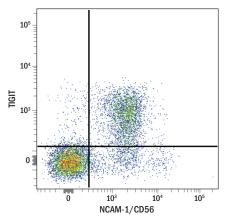


Products for Nectin and Nectin-like Binding Receptors and Ligands

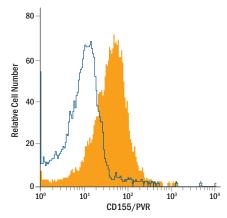
Receptors	Species		Unconjugated Antibodies (Applications)					
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
CD96	Mouse	FAB5690A		FAB5690P				MAB5690 (FC)
CD96v2	Human	FAB6199A						MAB6199 (FC)
CRTAM	Human	FAB16951A		FAB16951P				MAB16951 (FC, WB)
DNAM 1 (CD20C	Human	FAB666A	FAB666F	FAB666P				MAB666 (B/N, FC, WB)
DNAM-1/CD226	Mouse	FAB4436A		FAB4436P				MAB4436 (FC)
TIGIT	Human	FAB7898A		FAB7898P			FAB7898N	MAB7898 (FC)
IIGII	Mouse	FAB7267A				FAB7267G		AF7267 (FC)
Ligands								
CD155/PVR	Human	FAB25301A	FAB25301F	FAB25301P	FAB25301C			MAB25301 (FC, ICC/IF, WB)
CD155/PVK	Mouse	FAB6909A		FAB6909P		FAB6909G		MAB6909 (FC, ICC/IF, WB)
IGSF4A/SynCAM1/ Necl2	Mouse							AF1459 (WB)
No ation 4	Human	FAB2880A						MAB2880 (FC)
Nectin-1	Human/Mouse							AF2880 (WB)
Nectin-2/CD112	Human	FAB2229A		FAB2229P		FAB2229G	FAB2229N	AF2229 (WB)
	Mouse	FAB3869A		FAB3869P		FAB3869G		MAB3869 (FC); AF3869 (WB)
Nectin-3/CD113	Human							AF3064 (FC, IHC, WB)



Detection of DNAM-1/CD226 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and a Fluorescein-conjugated Mouse Anti-Human DNAM-1/CD226 Monoclonal Antibody (Catalog # FAB666F). Cells were gated on CD3 lymphocytes.

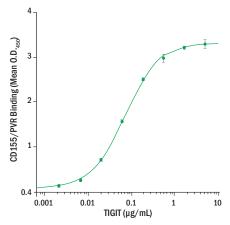


Detection of TIGIT on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and an APC-conjugated Mouse Anti-Human TIGIT Monoclonal Antibody (Catalog # FAB7898A). Cells were gated on CD3 lymphocytes.



Recombinant Proteins
Molecule

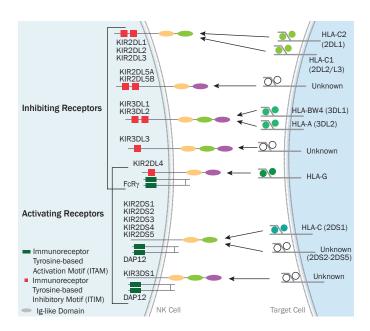
Molecule	Species	Catalog #s
CD96	Mouse	5690-CD
OD4EE/DVD	Human	2530-CD
CD155/PVR	Mouse	6909-CD
CRTAM	Human	1695-CR
CRIAW	Mouse	3687-CR
DNAM 4 (CDCCC	Human	666-DN
DNAM-1/CD226	Mouse	4436-DN
ICCEAA (Cur CANAA (No el C	Human	3519-S4
IGSF4A/SynCAM1/Necl2	Mouse	1459-S4
Nectin-1	Human	2880-N1
Naction 2 (CD440	Human	2229-N2
Nectin-2/CD112	Mouse	3869-N2
Nectin-3/CD113	Human	3064-N3
TIGIT	Human	7898-TG
i iidii	Mouse	7267-TG



CD155/PVR Binds to TIGIT. Immobilized Recombinant Human CD155/PVR (Catalog # 2530-CD; 2.5 $\mu g/mL)$ was incubated with increasing concentrations of Recombinant Human TIGIT (Catalog # 7898-TG). The concentration of Recombinant Human TIGIT that produces 50% of the optimal binding response is typically 0.02–0.1 $\mu g/mL$.

Killer Immunoglobulin-like Receptors

Killer immunoglobulin-like receptors (KIRs) are a highly polymorphic family of natural killer cell receptors that interact with MHC class I molecules and elicit inhibitory, activating, or dual signals. The high degree of sequence identity shared between KIR family members has led to difficulty in producing monoclonal antibodies with specificity for a single KIR family member. R&D Systems® KIR antibodies have been rigorously tested in-house to maximize the selection of highly specific clones. Selected clones have either a confirmed lack of cross-reactivity with other KIR family members or minimal cross-reactivities that are reported on our data sheets.



Products for Killer Immunoglobulin-like Receptors (KIRs)

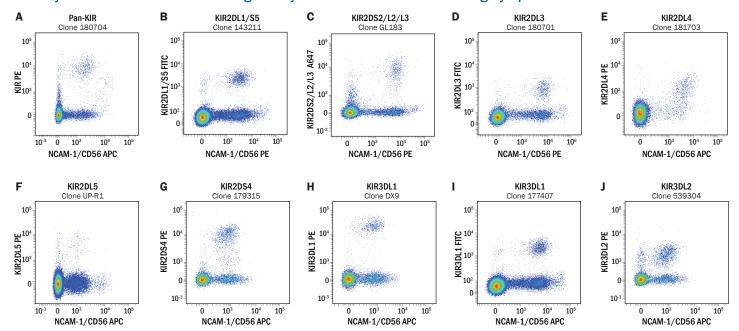
Antibodies

Molecule	Species		Unconjugated Antibodies (Applications)					
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
KIR pan/CD158	Human	FAB1848A	FAB1848F	FAB1848P				MAB1848 (FC)
Inhibitory receptors								
KIR2DL1/S5	Human	FAB1844A	FAB1844F	FAB1844P	FAB1844C	FAB1844G	FAB1844N	MAB1844 (FC)
KIR2DL3	Human	FAB2014A	FAB2014F	FAB2014P	FAB2014C			MAB2014 (FC)
KIR2DL4	Human	FAB2238A	FAB2238F	FAB2238P				MAB2238 (FA, FC)
KIR3DL1	Human	FAB1225A		FAB1225P				MAB1225 (B/N, FC)
		FAB12251A	FAB12251F	FAB12251P				MAB12251 (FC)
KIR3DL2	Human	FAB2878A		FAB2878P	FAB2878C		FAB2878N	MAB2878 (FC)
Activating receptors								
KIR2DL1/S5	Human	FAB1844A	FAB1844F	FAB1844P	FAB1844C	FAB1844G	FAB1844N	MAB1844 (FC)
KIR2DL4	Human	FAB2238A	FAB2238F	FAB2238P				MAB2238 (FA, FC)
KIR2DS4	Human	FAB1847A		FAB1847P		FAB1847G		MAB1847 (FC, WB)

Most fluorochrome-conjugated antibodies are available in both a 25-test and 100-test size.

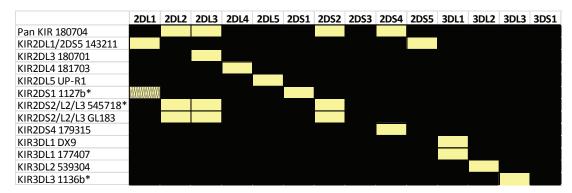


R&D Systems® KIR Antibodies Are Rigorously Tested for the Selection of Highly Specific Clones



Staining of Primary Natural Killer Cells with Anti-KIR Antibodies. Primary natural killer cells from freshly isolated peripheral blood mononuclear cells (PBMCs) were stained with either an APC- or PE-conjugated NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408A or # FAB2408P) and a (A) PE-conjugated Mouse Anti-Human KIR/CD158 (Catalog # FAB1848P), (B) Fluorescein-conjugated Mouse Anti-Human KIR2DL1/CD158a (Catalog # FAB1844F), (C) Alexa Fluor® 647-conjugated Mouse Anti-Human KIR2DS2/L2/L3 (D) FITC-conjugated Mouse Anti-Human KIR2DL3/CD158b2 (Catalog # FAB2014F), (E) PE-conjugated Mouse Anti-Human KIR2DL4/CD158d (Catalog # FAB2238P)*, (F) PE-conjugated Mouse Anti-Human KIR2DL4/CD158d (Catalog # FAB2238P)*, (F) PE-

conjugated Mouse Anti-Human KIR2DL5/CD158f, (G) PE-conjugated Mouse Anti-Human KIR2DS4/CD158i (Catalog # FAB1847P), (H) PE-conjugated Mouse Anti-Human KIR3DL1 (Catalog # FAB1225P), (I) Fluorescein-conjugated Mouse Anti-Human KIR3DL1 (Catalog # FAB12251F), or (J) PE-conjugated Mouse Anti-Human KIR3DL2/CD158k (Catalog # FAB2878P). *KIR2DL4/CD158d staining was performed on IL-2-activated PBMCs. All plots are gated on live lymphocytes. Alexa Fluor® 647-conjugated Anti-KIR2DS2/L2/L3 and PE-conjugated Anti-KIR2DL5 monoclonal antibodies are from Novus Biologicals. All other antibodies are from R&D Systems.

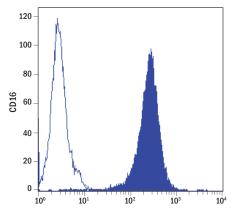


Summary of the Confirmed Reactivities of KIR Antibodies on Primary NK Cells. Using a panel of transfectants and primary natural killer cells, R&D Systems® anti-KIR monoclonal antibodies and KIR clones in development* were tested for cross-reactivity. The results are summarized in the map shown. The cross-hatched box for KIR2DS1 indicates allele-specific reactivity.

Recombinant Proteins

In addition to our KIR antibodies, R&D Systems offers a wide selection of recombinant KIR proteins that can be used to characterize natural killer cell – target cell interactions. These proteins are all developed and tested in-house to ensure purity, low endotoxin levels, and bioactivity.

Inhibitory Receptors						
Molecule	Species	Catalog #				
KIR2DL1	Human	1844-KR				
KIR2DL2	Human	3015-KR				
KIR2DL3	Human	2014-KR				
KIR2DL4	Human	2238-KR				
KIR2DL5	Human	6634-KR				
KIR3DL1	Human	1225-KR				
KIR3DL2	Human	2878-KR				
Activating Receptors						
KIR2DL4	Human	2238-KR				
KIR2DS4	Human	1847-KR				
KIR3DS1	Human	4136-KR				

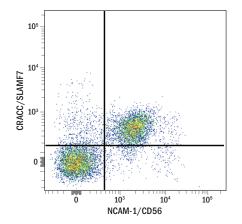


KIR3DL2 Binds to MDA-MB-231 Human Breast Cancer Cells. The MDA-MB-231 human breast cancer cell line was stained with Recombinant Human KIR3DL2/CD158k Fc Chimera (Catalog # 2878-KR; filled histogram) or Recombinant Human $\lg G_{1}/Fc$ (Catalog # 110-HG; open histogram). Binding was detected using a Biotin-conjugated Anti-Human $\lg G$ and PE-conjugated Streptavidin (Catalog # 50040)

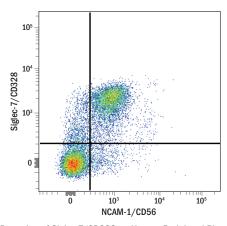
Other Select NK Cell Receptor/Ligand Pairs

Molecule	Species		Fluorochrome-conjugated Antibodies for Flow Cytometry (Catalog #s)				g #s)	Unconjugated Antibodies (Applications)
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
2B4/CD244/ SLAMF4	Human		FAB1039F	FAB1039P				MAB1039 (WB); AF1039 (E, FA, FC, IHC, WB)
	Mouse							AF1050 (FC, IHC, WB)
CD48/SLAMF2	Human	FAB3644A		FAB3644P				MAB3644 (FC, WB); MAB36441 (WB, ICC/IF); AF3644 (FC, WB)
	Mouse							MAB3327 (FC, WB); AF3327 (E, FC, ICC/IF, WB)
CD72	Mouse							MAB1279 (WB); AF1279 (ICC/IF, WB)
	Human	FAB6700A		FAB6700P		FAB6700G	FAB6700N	MAB6700 (FC); AF6177 (WB)
CD160	Mouse							MAB3899 (WB); MAB38991 (ICC/IF); AF3899 (FC, ICC/IF)
0540444	Human	FAB2244A		FAB2244P				MAB2244 (FC, WB); MAB22441 (E, IHC, WB); AF2244 (IHC, WB)
CEACAM-1	Mouse	FAB6480A		FAB6480P		FAB6480G	FAB6480N	MAB6480 (FC, IHC, WB); AF6480 (FC, IHC, WB)
	Human	FAB1906A		FAB1906P		FAB1906G	FAB1906N	MAB1906 (FC); AF1906 (WB)
CRACC/SLAMF7	Mouse	FAB4628A	FAB4628F					AF4628 (FC, WB); MAB4628 (WB); MAB46281 (FC)
KLRG1	Human							MAB70291 (WB)
KLRGI	Mouse	FAB6944A		FAB6944P		FAB6944G		MAB6944 (FC)
IL-2 Rβ	Human	FAB224A	FAB224F	FAB224P				MAB224 (B/N, FC, IHC); MAB2241 (WB); AF-224-NA (B/N, WB)
	Mouse							MAB589 (WB); MAB5891 (FC); AF589 (WB)
IL-12 Rβ1	Human	FAB839A	FAB839F	FAB839P	FAB839C		FAB839N	MAB839 (FC); AF839 (WB)
	Mouse		FAB1998F	FAB1998P				AF1998 (WB)
IL-12 Rβ2	Human							MAB19591 (WB); AF1959 (B/N, WB)
	Human/ Mouse	FAB1959A		FAB1959P	FAB1959C	FAB1959G		
	Mouse							MAB8650 (B/N)

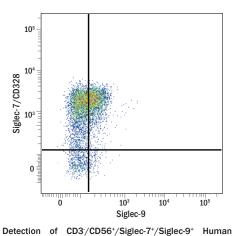
Molecule	Species		Fluorochrome-conjugated Antibodies for Flow Cytometry (Catalog #s)				g #s)	Unconjugated Antibodies (Applications)
		APC	Fluorescein	PE	PerCP	Alexa Fluor 488	Alexa Fluor 700	
IL-15 Rα	Human	FAB1471A		FAB1471P		FAB1471G	FAB1471N	MAB1471 (FC, WB); MAB147 (WB); AF247 (B/N, FC, IHC, WB)
	Mouse	FAB551A		FAB551P	FAB551C			AF551 (B/N, FC, WB); MAB551 (WB)
	iviouse	FAB5511A		FAB5511P				MAB5511 (FC)
IL-18 Rα	Human	FAB840A		FAB840P	FAB840C	FAB840G		MAB840 (B/N, FC, ICC/IF, IHC); MAB8401 (WB); AF840 (B/N, FC, IHC, WB)
	Mouse	FAB1216A	FAB1216F				FAB1216N	MAB1216 (FC, WB); MAB12161 (B/N, WB); AF856 (B/N, FC, WB)
IL-18 Rβ	Human		FAB118F	FAB118P				MAB118 (FC, WB); MAB1181 (B/N, WB); AF118 (B/N, WB)
·	Mouse							AF199 (WB)
II 04 D	Human	FAB9911A	FAB9911F	FAB9911P				MAB9911 (FC); MAB991 (WB); AF991 (FC, WB)
IL-21 R	Mouse			FAB5961P				MAB5961 (WB); MAB596 (WB); AF596 (FC, ICC/IF, WB)
LAIR1	Human	FAB2664A	FAB2664F	FAB2664P				MAB2664 (FC, WB); AF2664 (FC, WB)
LILRB1/CD85j/ ILT2	Human	FAB20171A	FAB20171F	FAB20171P				MAB20171 (FC, WB); MAB20172 (B/N, WB); MAB2017 (WB); AF2017 (B/N, FC, WB)
NKR-P1A/KLRB1	Human	FAB7448A		FAB7448P		FAB7448G		MAB7448 (FC)
NTB-A/SLAMF6	Human	FAB19081A	FAB19081F	FAB19081P	FAB19081C			MAB19081 (FC); MAB1908 (WB); AF1908 (WB)
	Mouse							MAB3986 (WB); AF3986 (FC, WB)
0011 (01 500 1	Human	FAB3480A		FAB3480P				AF3480 (FC, WB)
OCIL/CLEC2d	Mouse							AF3376 (WB)
PSGL1/CD162	Human	FAB9961A		FAB9961P		FAB9961G		MAB9961 (FC); MAB996 (B/N, FC); AF3345 (WB)
	Human		BBA33					BBA24 (E, FC); AF728 (B/N, WB)
L-Selectin/CD62L	Mouse		FAB5761F	FAB5761P				MAB5761 (FC); MAB5762 (E, FC, WB); MAB576 (FC, WB); AF576 (WB)
Companharin 4D/	Human	FAB74701A		FAB74701P		FAB74701G		MAB74701 (FC, WB); MAB7470 (ICC/IF)
Semaphorin 4D/ CD100	Mouse			FAB52351P	FAB52351C	FAB52351G		MAB52351 (FC); MAB5235 (WB); AF5235 (FC, IHC, WB)
Siglec-3/CD33	Human	FAB1137A	FAB1137F	FAB1137P				MAB1137 (FC, WB)
	Mouse							MAB2220 (WB); AF2220 (WB)
Siglec-7/CD328	Human	FAB11381A		FAB11381P		FAB11381G		MAB11381 (FC); MAB1138 (WB); AF1138 (B/N, FC, IHC, WB)
Siglec-9	Human	FAB1139A	FAB1139F	FAB1139P	FAB1139C	FAB1139G	FAB1139N	MAB1139 (B/N, E, FC, WB); AF1139 (FC, ICC/IF, WB)



Detection of CRACC/SLAMF7 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB2408P) and an APC-conjugated Mouse Anti-Human CRACC/SLAMF7 Monoclonal Antibody (Catalog # FAB1906A). Cells were gated on CD3 lymphocytes.



Detection of Siglec-7/CD328 on Human Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a PE-conjugated Mouse Anti-Human NCAM-1/CD56 Monoclonal Antibody (Catalog # FAB11381A) and an APC-conjugated Mouse Anti-Human Siglec-7/CD328 Monoclonal Antibody (Catalog # FAB11381A). Cells were gated on CD3: lymphocytes.



Peripheral Blood Lymphocytes by Flow Cytometry. Human peripheral blood lymphocytes were stained with a Fluorescein-conjugated Mouse Anti-Human Siglec-9 Monoclonal Antibody (Catalog # FAB1139F) and an APC-conjugated Mouse Anti-Human Siglec-7/CD328 Monoclonal Antibody (Catalog # FAB11381A) Cells were gated on CD3·CD56* lymphocytes.

Recombinant Proteins					
Molecule	Species	Catalog #			
OD4/OD044/CLAMF4	Human	1039-2B			
2B4/CD244/SLAMF4	Mouse	3514-2B			
0040/014MF0	Human	3644-CD			
CD48/SLAMF2	Mouse	3327-CD			
CD72	Human	5405-CD			
00400	Human	6177-CD			
CD160	Mouse	3899-CD			
CEACAM-1	Human	2244-CM			
CRACC/SLAMF7	Mouse	4628-SF			
KLRG1	Mouse	6944-KR			
LAIDA	Human	2664-LR			
LAIR1	Mouse	4016-LR			
LILRB1/CD85j/ILT2	Human	2017-T2			
NKR-P1A/KLRB1	Human	7448-CD			
NTD A (OLAME)	Human	1908-NT			
NTB-A/SLAMF6	Mouse	3986-NT			
PSGL1	Human	3345-PS			
PSGLI	Mouse	7407-PS			
L Calactia (ODCO)	Human	728-LS			
L-Selectin/CD62L	Mouse	576-LS			
Company AD/CD400	Human	7470-S4			
Semaphorin 4D/CD100	Mouse	5235-S4			
Siglec-3	Human	1137-SL			
Siglec-7	Human	1138-SL			
Siglec-9	Human	1139-SL			

Recent Publications Citing R&D Systems® Products for Natural Killer Cell Research

 Mou, X. et al. (2014) The regulatory effect of UL-16 binding protein-3 expression on the cytotoxicity of NK cells in cancer patients. Sci. Rep. 4:6138.

Recombinant Human NKG2D Fc Chimera (Catalog # 1299-NK)

Recombinant Human NKp44 Fc Chimera (Catalog # 2249-NK)

Recombinant Human ULBP-3 Fc Chimera (Catalog # 1517-UL)

Sample: Natural killer cells co-cultured with cancer

cell lines

Application: Cell culture

Mouse Anti-Human Fc gamma RIIIA/B (CD16a/b)
Monoclonal Antibody (Catalog # MAB2546)

Sample: Natural killer cells

Application: Flow Cytometry

 Killig, M. et al. (2014) Tracking in vivo dynamics of NK cells transferred in patients undergoing stem cell transplantation. Eur. J. Immunol. 44:2822.

APC-conjugated Mouse Anti-Human KIR2DL1
Monoclonal Antibody (Catalog # FAB1844A)

PE-conjugated Mouse Anti-Human NKG2C Monoclonal Antibody (Catalog # FAB138P)

Fluorescein-conjugated Mouse Anti-Human CCR7 Monoclonal Antibody (Catalog # FAB197F)

Sample: Natural killer cells isolated from peripheral blood mononuclear cells from healthy donors and acute myeloid leukemia patients

Application: Flow cytometry

 Qu, J. et al. (2014) Intracellular poly (I:C) initiated gastric adenocarcinoma cell apoptosis and subsequently ameliorated NK cell functions. J. Interferon Cytokine Res. 34:52.

PE-conjugated Mouse Anti-Human NKG2A Monoclonal Antibody (Catalog # FAB1059P)

Sample: AGS human gastric adenocarcinoma cell line

Application: Flow Cytometry

 Achour, A. et al. (2014) Expansion of CMV-mediated NKG2C* NK cells associates with the development of specific de novo malignancies in livertransplanted patients. J. Immunol. 192:503.

PE-conjugated Mouse Anti-Human NKG2C Monoclonal Antibody (Catalog # FAB138P)

APC-conjugated Mouse Anti-Human KIR3DL1 Monoclonal Antibody (Catalog # FAB1225A)

Fluorescein-conjugated Mouse Anti-Human KIR2DL1 Monoclonal Antibody (Catalog # FAB1844F)

Sample: Natural killer cells

Application: Flow Cytometry

 Gomez-Lomeli, P. et al. (2014) Increase of IFN-γ and TNF-α production in CD107a⁺ NK-92 cells co-cultured with cervical cancer cell lines pre-treated with the H0-1 inhibitor. Cancer Cell Int. 14:100.

APC-conjugated Mouse Anti-Human MICB Monoclonal Antibody (Catalog # FAB1599A)

PE-conjugated Mouse Anti-Human MICA Monoclonal Antibody (Catalog # FAB1300P)

Sample: Cervical cancer cell lines

Application: Flow Cytometry

 Holmes, T. et al. (2014) Licensed natural killer cells aid dendritic cell maturation via TNFSF14/LIGHT. Proc. Natl. Acad. Sci. USA 111:E5688.

APC-conjugated Mouse Anti-Human KIR2DL3
Monoclonal Antibody (Catalog # FAB2014A)

PE-conjugated Mouse Anti-Human KIR2DL3 Monoclonal Antibody (Catalog # FAB2014P)

APC-conjugated Mouse Anti-Human LIGHT/ TNFSF14 Monoclonal Antibody (Catalog # FAB664A)

Sample: Natural killer cells co-cultured with tumor

Application: Flow Cytometry

Goat Anti-Human TNF- α Polyclonal Antibody (Catalog # AF-210-NA)

Sample: Natural killer cells co-cultured with immature dendritic cells

Application: Neutralization

 Robinet, P. et al. (2014) A polysaccharide virulence factor of a human fungal pathogen induces neutrophil apoptosis via NK cells. J. Immunol. 192:5332.

Recombinant Human NKp44 Fc Chimera (Catalog # 2249-NK)

Recombinant Human NKp46/NCR1 Fc Chimera (Catalog # 1850-NK)

Recombinant Human NKp30 Fc Chimera (Catalog # 1849-NK)

Recombinant Human IgG₁ Fc (Catalog # 110-HG)

Mouse Anti-Human ULBP-1 Monoclonal Antibody (Catalog # MAB1380)

Mouse Anti-Human ULBP-2/5/6 Monoclonal Antibody (Catalog # MAB1298)

Mouse Anti-Human ULBP-3 Monoclonal Antibody (Catalog # MAB1517)

Sample: Human whole blood unstimulated or stimulated with lipopolysaccharide or galactosaminogalactan

Application: Binding assay for NK receptor ligands at the PMN surface

PE-conjugated Mouse Anti-Human MICA
Monoclonal Antibody (Catalog # FAB1300P)

PE-conjugated Mouse Anti-Human MICB Monoclonal Antibody (Catalog # FAB1599P)

 $\begin{array}{l} \textbf{PE-conjugated Mouse IgG}_{\text{2B}} \ \textbf{Isotype Control} \\ (\text{Catalog \# IC0041P}) \end{array}$

Sample: Human whole blood

Application: Flow Cytometry

Mouse Anti-Human MICA Monoclonal Antibody (Catalog # MAB1300)

Mouse Anti-Human TRAIL/TNFSF10 Monoclonal Antibody (Catalog # MAB375)

 $\begin{tabular}{ll} \textbf{Mouse Anti-Human TNF-}α & \textbf{Monoclonal Antibody}\\ (Catalog \# & \textbf{MAB210}) \end{tabular}$

Sample: Human whole blood or isolated human polymorphonuclear neutrophils alone or co-cultured with NK cells

Application: Neutralization

 Hu, X. et al. (2014) Long-term effect on natural killer cells by interferon-alpha therapy on the outcomes of HCV infection. J. Interferon Cytokine Res. 34:366.

PE-conjugated Mouse Anti-Human NKG2D Monoclonal Antibody (Catalog # FAB139P)

Mouse Anti-Human KIR2DL3 Monoclonal Antibody (Catalog # MAB2014)

Mouse Anti-Human NKG2A Monoclonal Antibody (Catalog # MAB1059)

Mouse Anti-Human NKG2C Monoclonal Antibody (Catalog # MAB138)

Sample: Natural killer cells **Application**: Flow Cytometry

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BR_Natural Killer Cells_1533



